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Europäisches Patentamt  
European Patent Office  
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(11) Publication number:

**0 392 625**  
**A1**

(12)

# EUROPEAN PATENT APPLICATION

(21) Application number: 90200862.2

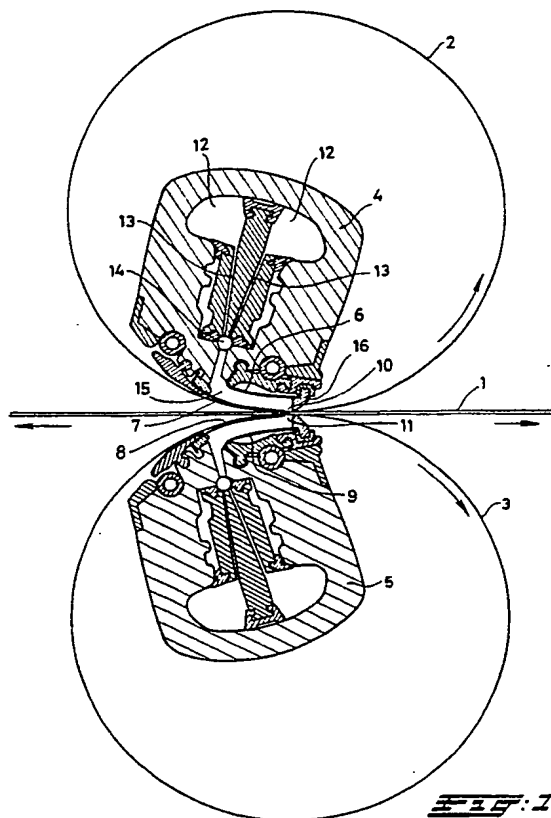
(51) Int. Cl.<sup>5</sup>: **B41F 15/08, B41F 15/42**

(22) Date of filing: 09.04.90

(30) Priority: 12.04.89 NL 8900915

(43) Date of publication of application:  
17.10.90 Bulletin 90/42(84) Designated Contracting States:  
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**NL-2509 LP 's-Gravenhage(NL)**(54) **Device for two-sided coating, and process for the coating of a web of material.**

(57) Described is a device which allows for uniformly coating a horizontally moving substrate (1). So that end at least one assembly is present of two rotary screen stencils (2, 3) which are arranged opposite to each other on both sides of the substrate (1). The uniformity is reached by using at least in the stencil below the substrate (1) a medium feed device (4, 5) of the closed type having a slit shaped outlet aperture (10, 11) which rests in contact with the inside wall of the stencil (2, 3) concerned and which allows for accurate control of the deposition of printing medium on the substrate. Described is also a method for coating a substrate with use of a device according to the invention.



**FIG. 1.**

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**Device for two-sided coating, and process for the coating of a web of material.**

The invention relates to a device for coating a moving material web on both sides, at least comprising a frame and one or more assemblies of rotary screen printing stencils arranged opposite each other on either side of the web, the material web to be coated being in contact with both rotary screen printing stencils, and a medium feed device set up inside each of the rotary screen printing stencils. Such a device is known from Dutch Patent Application 6905679.

The above-mentioned publication describes a device of the above-mentioned type, in which a material is printed on both sides thereof with a pattern using screen printing stencils containing medium feed devices which in this case are in the form of squeegees. The substrate is preferably moved in the downward direction and, after leaving the contact line between the two opposite stencils, is guided through a drying device, such as a drying tunnel, which is arranged vertically. In the case of vertical movement of the medium to be printed, a drying device must follow the coating or printing position, in order to dry the coated or printed material, so that thereafter the material can be brought into contact with guide means such as, for example, rollers.

Such an arrangement produces problems in those cases where the printing or coating operation has to take place at high speed.

In the case of vertical movement of the web, this can lead to a great required length of the drying device, which is often not possible in many existing buildings; the overall height required is in that case much greater than that which can be found in most buildings.

The object of the present invention is to produce a device of the above-mentioned type which can be accommodated in buildings of normal size, and in particular of normal height.

This object is achieved according to the invention for a device of the type mentioned in the preamble in that the device is equipped for conveying the material web to be coated essentially horizontally, and in each of the assemblies of rotary screen printing stencils at least one of the medium feed devices is of a closed type which is provided with a slit-shaped outlet aperture for the coating medium which is in contact with the inside wall of the rotary screen printing stencil in question.

If a device of the known type described in the earlier mentioned Dutch Patent Application 6905679 is designed in such a way that the material web is conveyed essentially in the horizontal direction, the problem of uneven printing or coating occurs, despite the fact that the various settings

such as squeegee angle and squeegee pressure are the same in both stencils. This is due to the fact that in a stencil which in such a device is placed above the substrate to be printed the force of gravity works in the same direction as that in which pressure medium conveyance is taking place, while in the stencil which is placed below the substrate to be printed the force of gravity works in the opposite direction to that of the movement of pressure medium.

In particular during printing at relatively low speed, this will lead to undesirable unevenness of the printing density on the two sides of the substrate. Where the same stencils, the same squeegee angles and the same squeegee settings in squeegees which are also fully identical are used, the coating density should, however, be the same on both sides.

Such a problem does not occur in the above-described device according to the state of the art, since in that case the force of gravity acts in the same way on the conveyance of pressure medium through the perforations of the stencils used to the substrate.

What is now achieved by working according to the invention with an essentially horizontally moving material web with at least one medium feed device of a closed type is that the coating densities on the two sides of the horizontally moving substrate can be set in a simple and reproducible manner relative to each other, for example made the same. Of course, a preselected and reproducibly set difference between two coating densities can also be achieved. Using the device according to the invention now means that it can be accommodated in ordinary buildings, due to the fact that the material web moves essentially horizontally, while in all circumstances a fixed relation between the coating densities at both sides of the substrate can be set and maintained. In particular, in the above-described device according to the invention, the medium feed device of the closed type will be located in the stencil of the assembly which is below the conveyed material web. A medium feed device of the closed type expediently mates with both stencils of an assembly of rotary screen printing stencils. In all cases the stencils of an assembly will lie below and above the conveyed material web and opposite each other, in such a way that the stencils of an assembly touch each other along an essentially horizontal line and the material web is in contact with the two stencils along said contact line. Where two medium feed devices of the closed type are used, the slit-shaped outlet aperture of the two medium feed

devices will be positioned in the same way relative to the earlier mentioned contact line, so that a full cover of the projections of said slit-type aperture on the substrate takes place.

It is pointed out that the medium feed device of the closed type described above is known per se from European Patent Application with publication number 0285217. Said medium feed device of the closed type, which is known per se, excels through evenness of application, viewed in the widthwise direction of the substrate, and therefore in the lengthwise direction of the medium feed device.

It has now been found that the use of such a medium feed device provides the possibility of assembling a device for coating or printing a material web, in which the material web moves essentially horizontally, and in which with the same setting of identical medium feed devices at the two sides of the substrate a fully identical printing result or a predetermined settable difference between the two printing results can be achieved as desired.

In this case, printing result is understood to mean coating layer thickness, coating density, colour depth, or definition and cover.

In the present description, printing and coating are used interchangeably, in general coating meaning a uniform covering coating, while printing is understood to mean a patterned coating. If the substrate to be printed in the form of a material web is of great width, sagging of the housings of the medium feed devices can occur, which could still give rise to uneven application. In order to eliminate such a disadvantage, each of the medium feed devices is provided with adjusting means, in order to prevent sagging of the medium feed device. In particular, the adjusting means comprise one or more pull bars which mate with the medium feed device body, and which through tightening give the medium feed device additional strength, and by means of which any sagging occurring can easily be compensated for when such cases arise.

It is pointed out that the use of pull bars for medium feed devices is known per se from French Patent Application 2272840. In the above-mentioned publication there is no reference to the use of pull bars in the case of medium feed devices of a closed type which are set up in stencils resting against the top and bottom side of an essentially horizontally moving substrate. In view of the shape of the medium feed device, a medium feed device containing several, for example three, pull bars will generally be selected in order to be able to achieve the desired compensation.

The invention also relates to a process for coating a material web in which a coating is first applied to both sides of the material web by means of one or more assemblies of rotary screen printing stencils arranged opposite each other on either

side of the material web and the coating is subjected to one or more drying operations.

The process indicated above is according to the invention characterized in that it is carried out by means of a device in which, prior to and during the drying, or each drying, a material web is conveyed essentially horizontally, and which is constructed in the manner described above according to the invention.

Through use of the process according to the invention it is possible to obtain a substrate which is provided with a coating or printing on two sides, while the qualities of the coating or printing on two sides are of a predetermined relationship which can be adjusted relative to each other. The relationship can be such that the printing quality, such as, for example, the density, thickness, colour depth etc. is the same on both sides; it is also possible to make the properties of the coating or the printing on both sides of the substrate differ from each other by a fixed, preset value.

The invention will now be described with reference to the drawing, in which in figure 1 the substrate to be coated or printed on two sides is indicated by 1, and the stencils set up on either side of the substrate are indicated by 2 and 3 respectively.

Two medium feed devices of the closed type such as those described in the earlier-mentioned European patent publication 0285217 are indicated by 4 and 5. The medium feed devices have flexible squeegee blades 6, 7, 8 and 9, the single aperture being formed by the medium outlet apertures 10 and 11, which are slit-shaped and rest against the inside of the stencils 2 and 3 which are in contact with the substrate 1 to be printed. Both medium feed devices are made identical in this case, so that for the further description of the medium feed devices a description of medium feed device 4 will suffice. The medium outlet slit 10 is the only aperture located in the medium collection space 15 which connects to a cavity 14. The medium is fed by means not shown in any further detail into the medium distribution spaces 12, from where said medium flows via the narrow channels 13 to the cavity 14 under the influence of a pressure generation device such as a pump connected to the medium feed device.

It is clear from the figure shown here that the medium feed device in this case is a fully closed medium feed device which has only a medium outlet aperture 10 which rests against the inside of the stencil 2. Through use of an accurately regulable pump or, for example, through use of a pressure tank with an accurately settable pressure, excellent metering of pressure medium is achieved, said medium flowing via the outlet slit 10 through the holes of the stencil 2 used and coming

to rest on the top surface of the horizontally conveyed substrate 1. The same operation takes place at the bottom side of the substrate by means of the stencil 3 placed below the substrate. The substrate has a conveyance speed which is essentially the same as the peripheral speeds of the stencils 2 and 3 used. In the case of the medium feed devices of the closed type, a shut-off device will, of course, be present to shut off the medium feed device at the ends, and a shut-off device is also present to ensure a lateral boundary of the cavity 14 and the pressure medium collection space 15. The medium feed device is fixed in the device, in a manner not shown in any further detail, while the stencils and the drive thereof are also present in the device in a manner not shown in any further detail. During the operation of such a device, each assembly of two stencils can expediently be followed by a drying device which ensures such drying that a new coating or pattern part can be printed again in a subsequent assembly. The device can also comprise only one assembly of stencils, following which the subsequent drying is directly the final drying. The drier used in conjunction with the device according to the invention will in general be a so-called float drier, i.e. a drier of the type in which during the drying operation the material to be dried floats on an arrangement of feed nozzles, through which heating medium such as warm air is fed in, in such quantities that no contact takes place between the still damp coated substrate and the above-mentioned nozzles. Any contact of the substrate with, for example, guide rollers can in this way be avoided until sufficient drying has taken place. As regards the stencils to be used, seamless metal rotary screen printing stencils will in general be used, for example nickel screen printing stencils in finenesses between 25 and 500 mesh (mesh in this case is the number of holes per linear inch) and thicknesses between 100 and 300 micrometres, but it is pointed out that finenesses deviating from these finenesses and greater or smaller thicknesses can also be used.

The substrate to be printed, in the form of a material web, can be in all kinds of forms, such as paper, fabric, plastic film, non-woven fabric etc.

Fig. 2 indicates schematically that, in order to counteract sagging, a medium feed device can be provided with one or more pull bars 17, 18 and 19. Tightening the pull bars can compensate very accurately for any sagging which occurs, which occurs particularly in the case of long medium feed devices, i.e. in the case of great substrate widths, which means that very good evenness of printing is obtained. For the medium feed devices of the closed type used in the figures, the squeegee blade 6 is provided at its end with a strip 16 of material with a low coefficient of friction, such as

polythene or teflon. Such a strip serves to provide a good seal between the end of the squeegee blade 6 and the inside of the stencil, for the purpose of preventing the passage of printing medium at the end.

It is pointed out that the invention is not restricted to the use of a medium feed device of a closed type as indicated in the figure. The other medium feed devices described in the earlier-mentioned European patent publication 0285217 can also be used, while medium feed devices of a closed type falling outside the above-mentioned publication can also be used.

## Claims

1. Device for coating a moving material web on both sides, at least comprising a frame and one or more assemblies of rotary screen printing stencils arranged opposite each other on either side of the web, the material web to be coated being in contact with both rotary screen printing stencils, and a medium feed device set up inside each of the rotary screen printing stencils, **characterized in that** the device is equipped for conveying the material web (1) to be coated essentially horizontally, and in each of the assemblies of rotary screen printing stencils (2, 3) at least one of the medium feed devices (4, 5) is of a closed type which is provided with a slit-shaped outlet aperture (10, 11) for the coating medium which is in contact with the inside wall of the rotary screen printing stencil (2, 3) in question.

2. Device according to Claim 1, **characterized in that** of each of the assemblies of rotary screen printing stencils (2, 3) the medium feed device (4, 5) which mates with the rotary screen printing stencil (2, 3) which is below the conveyed material web (1) is a medium feed device (4, 5) of the closed type.

3. Device according to Claim 1, **characterized in that** a medium feed device (4, 5) of the closed type mates with both rotary screen printing stencils (2, 3) of an assembly of rotary screen printing stencils (2, 3).

4. Device according to one or more of Claims 1-3, **characterized in that** each of the medium feed devices (4, 5) is provided with adjusting means in order to prevent sagging of the medium feed device.

5. Device according to Claim 4, **characterized in that** the adjusting means comprise one or more pull bars (17, 18, 19) which mate with the medium feed device body.

6. Process for coating a material web in which a coating is first applied to both sides of the material web by means of one or more assemblies

of rotary screen printing stencils arranged opposite each other on either side of the material web and the coating is subjected to one or more drying operations, **characterized in that** it is carried out by means of a device in which, prior to and during the drying or each drying, a material web (1) is conveyed essentially horizontally, and which is constructed in the manner indicated in one or more of the preceding claims 1 - 5.

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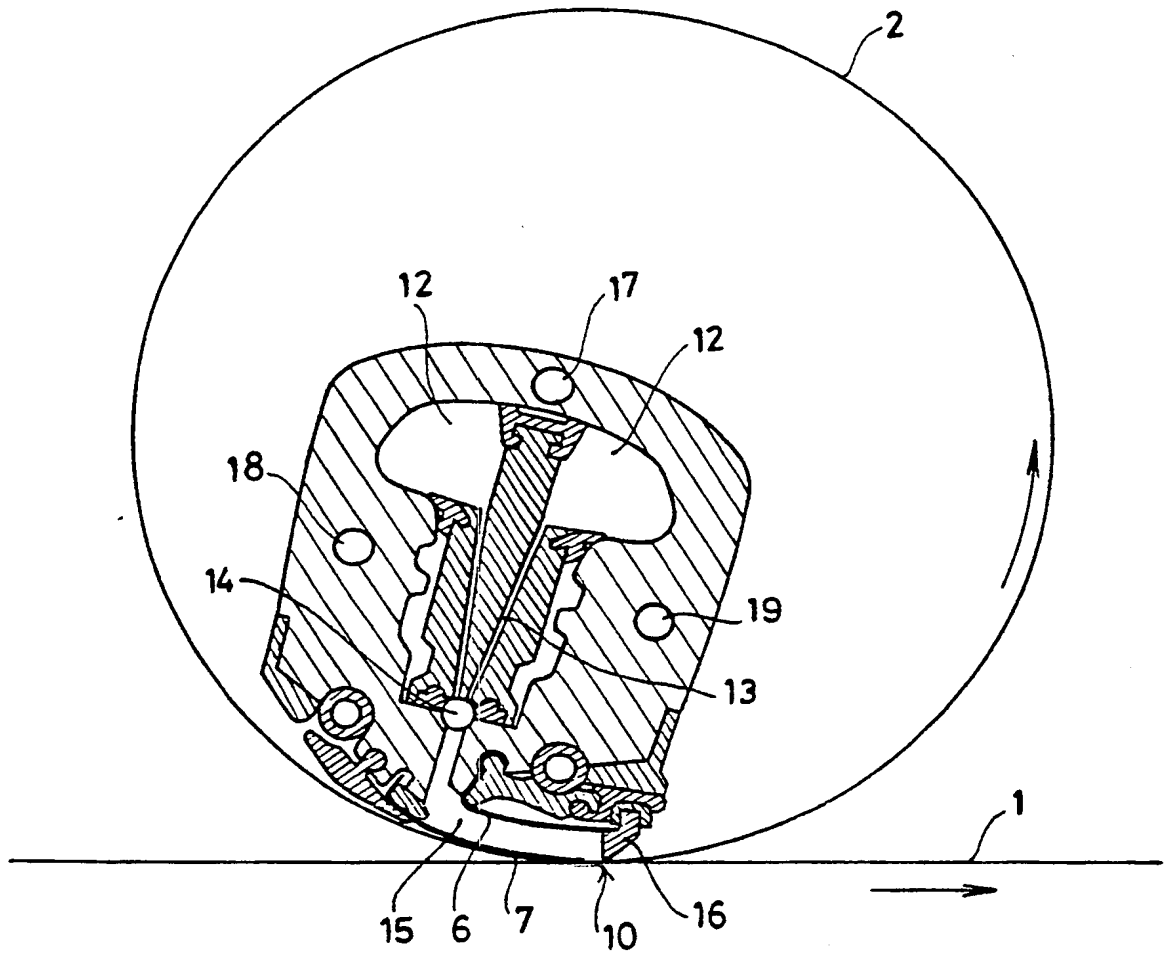
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**FIG. 2.**



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## EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0862

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-1054407 (SOCIETE ANONYME GUILLET-THAON) * page 2, lines 16 - 101; claims 1-6; figures 1-5 *	1-6	B41F15/08 B41F15/42
Y,D	EP-A-285217 (STORK BRABANT B.V.) * columns 1 - 3; claims 1-12; figure 1 *	1-6	
Y	DE-A-2061014 (NEODON-WERKE HELMUT SALLINGER) * claims 1, 2; figure 1 *	2	
Y	DE-A-2638344 (SIR JAMES FARMER NORTON & CO. LTD.) * page 12, lines 5 - 22; claims 1, 21; figures 1, 5-7 *	3	
Y,D	FR-A-2272840 (SOCIETE ALSACIENNE DE CONSTRUCTIONS MECANIQUES DE MULHOUSE) * page 3, lines 15 - 27; claims 1-9; figures 1-8 *	4, 5	
Y	FR-E-54838 (DUNGLER) * claims 1-5; figures 1, 9, 11 *	6	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	DE-A-1947954 (BILLIET) * claims 1-14; figures 1-3 *	1-6	B41F
A	CH-A-395913 (ELECTROSTATIC PRINTING CORPORATION OF AMERICA) * page 5, lines 44 - 61; claim 1; figure 4 *	1-6	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05 JUNE 1990	Examiner DIAZ-MAROTO V.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	

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